LOW POWER SOFTWARE HEVC DECODER DEMO FOR MOBILE DEVICES

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ABSTRACT

Video on mobile devices is a must-have feature with the prominence of new services and applications using video like streaming or conferencing. By improving the compression performance by a factor of two with a similar quality, the new video standard High Efficiency Video Coding (HEVC) is an appealing technology for service providers. Besides, with the recent progress of Systems-on-Chip (SoC) for mobile devices, software video decoders is now a reality. On top of providing a high flexibility of implementation, it offers a mean to a fast HEVC deployment on the existing devices without waiting for hardware compatible solutions. Finally, the challenge is also to provide power efficient design to fit with the compelling demand for long battery life on mobile devices. We present here a practical set-up demonstrating that the new HEVC standard can be implemented on on-the-market devices where hardwired decoding is not possible. We also show a subjective evaluation of the low power HEVC decoder within the scope of MPEG Green Metadata. It shows that power savings close to 7% can be achieved on a typical smartphone including the rendering on the screen.

***Index Terms*—** HEVC, low power, Green Metadata

1. INTRODUCTION

A high pressure is put on portable devices to support a wide range of applications from telecommunications to multimedia services. This constraint requires increasing on-board processing capabilities. Thanks to recent advances, modern Systems-on-Chip (SoC) can offer such capabilities. Hence, many applications that were traditionally hardwired can now be implemented in software bringing flexibility and short time to market. This is particularly the case of the latest video standard High Efficiency Video Coding (HEVC) [1, 2]. However, high computational capability comes at the cost of a higher power consumption if no dedicated scheme is adopted at the design phase. As video on mobile is expected to exceed 70 % of the internet traffic in 2016, it is crucial for the end-devices to provide a sufficiently long battery life given the quantity of energy needed for the decoding.

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Acknowledging that video on mobile devices will secure the future of video compressions standard, MPEG issued a Call for Proposals (CfP) on energy-efficient video consumption called Green Metadata [3]. When battery levels begin to be low, users may choose to reduce the Quality of Experience (QoE) to make large power savings. Within this scope, we propose a software based modified HEVC decoder to reduce the overall complexity.

Firstly we propose here to show that pure software decoder can achieve real time HEVC decoding. This is particularly appealing for service providers that want to deploy HEVC rapidly on non-HEVC compatible hardware devices. Secondly, we demonstrate that more power savings can be achieved using a modified HEVC decoder as per proposed within Green Metadata. Power savings close to 7% can be achieved with a slight degradation of the QoE.

2. OPENHEVC DECODER FOR MOBILE DEVICES

Because the challenge is also to design a power efficient decoder, we propose here a modified HEVC decoder for low power design. The modified HEVC decoder presented at MPEG Green Metadata working group [4]. A typical HEVC decoder is depicted in Fig. 1. Based on the high relative complexity of the filtering functions, the proposed modified HEVC decoder suggests to change the filtering functions to less complex ones. This implementation is detailed in [5].

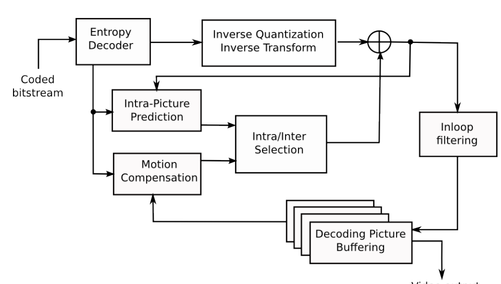

Fig. 1. Simplified diagram of an HEVC decoder.

3. BENCH SET-UP

In this section, the demo test bench is depicted as well as the software set-up. The power consumption is measured with a ODROID power meter device. It collects voltage, current and power of the system load. The measurements are performed at a sampling rate of 10 Hz. The Device Under Test (DUT) is directly connected to the power meter device supplying it as depicted in Fig. 2.

Fig. 2. Bench set-up

The HEVC decoder is taken from the legacy implementation of OpenHEVC [6]. The low power modifications of the reference implementation are performed as per described in our previous work [5]. The realtime management of video rendering is performed with the android version of GPAC [7]. The reference input HEVC bitstream RaceHorses [8] is used and is encapsulated in a MP4 file using the MP4Box executable as follows at 30 frames per second:

```
MP4Box -add RaceHorses.265:fps=30 RaceHorses.mp4
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The power performances are measured on a on-the-market device : a Samsung GT-i9070. It embeds a General Purpose Processor (GPP) dual-core 1GHz Cortex-A9. The video decoder uses this GPP to perform its processing.

Table 1 shows how the power budget is split between the different elements of the DUT and the possible power saving over the complete device.

Table 1. Power consumption repartition

Elements	Legacy Decoder	Low Power decoder
idle (W)	0.9	0.9
screen	0.7	0.7
video decoder	0.6	0.45
Power saving	-	6.9 (%)

4. CONCLUSIONS

In this paper, a pure software HEVC decoder is demoed on a typical smartphone with no specific HEVC hardware decoder available. Even though hardwired decoder is not present, it shows that services and applications relying on HEVC standard can be performed. We also demo a low power version of HEVC decoder as per suggested within the MPEG Green Metadata working group. This version can achieve higher power savings with a limited impact on the QoE. Hence it can improve the stand-by-time of battery oriented devices. In a future work, our HEVC decoder will implement more power efficient schemes such as voltage and frequency control to make further savings.

5. REFERENCES

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